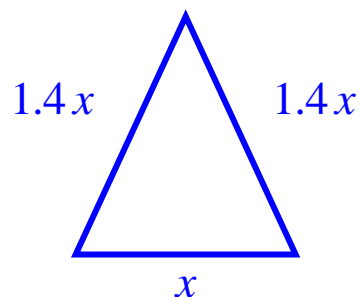


1. The two congruent sides of an isosceles triangle are each 1.4 times the length of the third side. The perimeter of the triangle is 83.6 inches. How long is each side of the triangle?

Define  $x$  to be the length of the non-congruent side of the triangle (measured in inches).

From the drawing and the fact that the perimeter is 83.6 inches we have:

$$\begin{aligned} 1.0x + 1.4x + 1.4x &= 83.6 \\ 3.8x &= 83.6 \\ \frac{3.8x}{3.8} &= \frac{83.6}{3.8} \\ x &= 22 \end{aligned}$$



This gives us  $1.4x = 1.4(22) = 30.8$ .

Does this answer make sense?

$$20 + 30.8 + 30.8 = 83.6$$

Yep – makes sense.

So the lengths of the sides of the triangle are 22", 30.8", and 30.8".

7. Solve each formula for the specified letter.

- a. Solve  $a = b + c + d$  for  $b$ .

$$\begin{aligned} a &= b + c + d \\ a - c - d &= b + c + d - c - d \\ a - c - d &= b \end{aligned}$$

- b. Solve  $a = bcd$  for  $b$ .

$$\begin{aligned} a &= bcd \\ \frac{a}{cd} &= \frac{bcd}{cd} \\ \frac{a}{cd} &= b \end{aligned}$$

- c. Solve  $a = b(c + d)$  for  $b$ .

$$\begin{aligned} a &= b(c + d) \\ \frac{a}{(c + d)} &= \frac{b(c + d)}{(c + d)} \\ \frac{a}{c + d} &= b \end{aligned}$$

- d. Solve  $a = bc + d$  for  $b$ .

$$\begin{aligned} a &= bc + d \\ a - d &= bc + d - d \\ a - d &= bc \\ \frac{a - d}{c} &= \frac{bc}{c} \\ \frac{a - d}{c} &= b \end{aligned}$$

e. Solve  $a = b + cd$  for  $b$ .

$$\begin{aligned} a &= b + cd \\ a - cd &= b + cd - cd \\ a - cd &= b \end{aligned}$$

f. Solve  $a = \frac{b}{cd}$  for  $b$ .

$$\begin{aligned} a &= \frac{b}{cd} \\ a \cdot cd &= \frac{b}{cd} \cdot \frac{cd}{1} \\ acd &= b \end{aligned}$$

g. Solve  $a = \frac{bc}{d}$  for  $b$ .

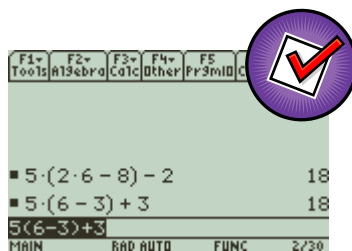
$$\begin{aligned} a &= \frac{bc}{d} \\ a \cdot d &= \frac{bc}{d} \cdot \frac{d}{1} \\ ad &= bc \\ \frac{ad}{c} &= \frac{bc}{c} \\ \frac{ad}{c} &= b \end{aligned}$$

h. Solve  $a = \frac{b}{c} + d$  for  $b$ .

$$\begin{aligned} a &= \frac{b}{c} + d \\ a - d &= \frac{b}{c} + d - d \\ a - d &= \frac{b}{c} \\ (a - d) \cdot c &= \frac{b}{c} \cdot \frac{c}{1} \\ ac - dc &= b \end{aligned}$$

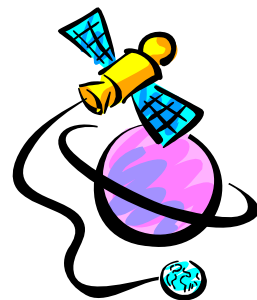
4. Find the solution to the equation  $5(2x - 8) - 2 = 5(x - 3) + 3$ .

$$\begin{aligned} 5(2x - 8) - 2 &= 5(x - 3) + 3 \\ 10x - 40 - 2 &= 5x - 15 + 3 \\ 10x - 42 &= 5x - 12 \\ 10x - 42 - 5x &= 5x - 12 - 5x \\ 5x - 42 &= -12 \\ 5x - 42 + 42 &= -12 + 42 \\ 5x &= 30 \\ \frac{5x}{5} &= \frac{30}{5} \\ x &= 6 \end{aligned}$$



The solution to the equation  $5(2x - 8) - 2 = 5(x - 3) + 3$  is 6.

3. The Spuntick satellite is on a journey through our solar system. Spuntick cruises at a constant speed of 35,466 mph. The distance from Jupiter to Saturn is about  $4.0 \times 10^8$  miles. How many *years* did it take Spuntick to fly from Jupiter to Saturn? Round your solution to the nearest tenth.



Define  $t$  to be the total flight time (years).

From the formula  $D = rt$  we get:

$$400,000,000 \text{ miles} = \left( 35,466 \frac{\text{miles}}{\text{hr}} \right) \cdot t$$

$$\frac{400,000,000 \text{ miles}}{\left( 35,466 \frac{\text{miles}}{\text{hr}} \right)} = \frac{\left( 35,466 \frac{\text{miles}}{\text{hr}} \right) \cdot t}{\left( 35,466 \frac{\text{miles}}{\text{hr}} \right)}$$

$$11,278.4 \text{ hr} \approx t$$

We were asked to find the number of *years* the journey takes.

$$11,278.4 \text{ hr} = \left( 11,278.4 \cancel{\text{hr}} \right) \cdot \left( \frac{1 \cancel{\text{day}}}{24 \cancel{\text{hr}}} \right) \cdot \left( \frac{1 \text{ year}}{365 \cancel{\text{days}}} \right)$$

$$\approx 1.29 \text{ years}$$

So the journey takes about 1.29 years.

#### Unit Analysis

$$\begin{aligned} \frac{\text{miles}}{\frac{\text{miles}}{\text{hr}}} &= \frac{\frac{\text{miles}}{1}}{\frac{\text{miles}}{\text{hr}}} \\ &= \frac{\cancel{\text{miles}}}{1} \cdot \frac{\text{hr}}{\cancel{\text{miles}}} \\ &= \text{hr} \end{aligned}$$

#### CAUTION

Remember that in these type problems you need to write the units **into your calculation**.

5. Find the solution set to  $5t - 3(t + 1) = 2(t + 3) - 5$ .

$$5t - 3(t + 1) = 2(t + 3) - 5$$

$$5t - 3t - 3 = 2t + 6 - 5$$

$$2t - 3 = 2t - 1$$

$$2t - 3 - 2t = 2t - 1 - 2t$$


$$-3 = -1$$

The solution set to  $5t - 3(t + 1) = 2(t + 3) - 5$  is  $\{ \}$ .

The only way to check a contradiction is to double check your work; or, better yet, rework the problem.

6. Find the solution set to the equation  $\frac{x}{2} - \frac{x}{4} + 4 = x + 4$ .

$$\begin{aligned}\frac{x}{2} - \frac{x}{4} + 4 &= x + 4 \\ 4 \cdot \left( \frac{x}{2} - \frac{x}{4} + 4 \right) &= 4 \cdot (x + 4) \\ \frac{4}{1} \cdot \frac{x}{2} - \frac{4}{1} \cdot \frac{x}{4} + 4 \cdot 4 &= 4x + 16 \\ 2x - x + 16 &= 4x + 16 \\ x + 16 &= 4x + 16 \\ x + 16 - x &= 4x + 16 - x \\ 16 &= 3x + 16 \\ 0 &= 3x \\ \frac{0}{3} &= \frac{3x}{3} \\ 0 &= x\end{aligned}$$

$$\frac{0}{2} - \frac{0}{4} + 4 = 0 + 4$$


The solution set to the equation

$$\frac{x}{2} - \frac{x}{4} + 4 = x + 4 \text{ is } \{0\}.$$

7. Find the solution to the equation  $2(y + 4) = 4y + 5 - 2y + 3$ .

$$\begin{aligned}2(y + 4) &= 4y + 5 - 2y + 3 \\ 2y + 8 &= 2y + 8 \\ 2y + 8 - 2y &= 2y + 8 - 2y \\ 8 &= 8\end{aligned}$$

F1 Tools	F2 Algebra	F3 Calc	F4 Other	F5 Pr3mID	F6 Clean Up
2 · (0 + 4)					
					8
4 · 0 + 5 - 2 · 0 + 3					
					8
2 · (1 + 4)					
					10
4 · 1 + 5 - 2 · 1 + 3					
					10
4 · 1 + 5 - 2 · 1 + 3					
					10
MAIN    RAD AUTO    FUNC    4/30					

Check 0

Check 1

Every real number is a solution to the equation  $2(y + 4) = 4y + 5 - 2y + 3$ !

8. Find the solution to  $100 = 4(w - 6) - (w - 1)$ .

$$\begin{aligned}100 &= 4(w - 6) - (w - 1) \\ 100 &= 4w - 24 - w + 1 \\ 100 &= 3w - 23 \\ 100 + 23 &= 3w - 23 + 23 \\ 123 &= 3w \\ \frac{1}{3} \cdot (123) &= \frac{1}{3} \cdot (3w)\end{aligned}$$

$$41 = w$$

The solution to  $100 = 4(w - 6) - (w - 1)$  is 41.

$$\begin{aligned}100 &= 4(41 - 6) - (41 - 1) ? \\ 100 &= 4(35) - 40 ? \\ 100 &= 140 - 40\end{aligned}$$



9. In a recent election in Florida for a seat in the United States House of Representatives, Corrine Brown received 13,288 more votes than Bill Randall. If the total number of votes was 119,436, find the number of votes for each candidate.

Define  $x$  to be the number of votes Bill Randall received. Then Corrine Brown received  $x + 13,288$  votes. Since the total number of votes cast was 119,436, we have:

$$\begin{aligned}
 x + (x + 13,288) &= 119,436 \\
 2x + 13,288 &= 119,436 \\
 2x + 13,288 - 13,288 &= 119,436 - 13,288 \\
 2x &= 106,148 \\
 \frac{2x}{2} &= \frac{106,148}{2} \\
 x &= 53,074 \\
 x + 13,288 &= 66,362
 \end{aligned}$$

Check

$$53,074 + 66,362 = 119,436$$



Ms. Brown received 66,362 votes while Mr. Randall received only 53,074 votes.

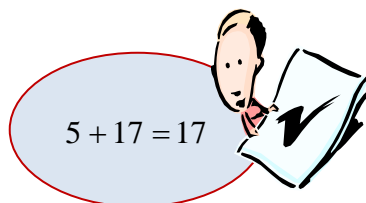
10. A 17-foot piece of rope is cut into two pieces so that one piece is 2 feet longer than twice the shorter piece. If the shorter piece is  $x$  feet long, find the lengths of both pieces. To receive full credit for this question, you must write an equation that accurately models the problem and solve that equation. Don't forget to write a sentence conclusion.

The variable was defined for us, so we can jump right into finding the solution.

The shorter piece has length  $x$  (ft), so the longer piece has length  $2x + 2$  (ft). Since the rope is 17 ft long, we have:

$$\begin{aligned}
 x + (2x + 2) &= 17 \\
 3x + 2 &= 17 \\
 3x + 2 - 2 &= 17 - 2 \\
 3x &= 15 \\
 \frac{3x}{3} &= \frac{15}{3} \\
 x &= 5 \\
 2x + 2 &= 12
 \end{aligned}$$

The pieces are of length 5 ft and 12 ft.



11. Find the solution set to  $7 + 2(3z - 5) = 8 - 3(2z + 1)$ .

$$7 + 2(3z - 5) = 8 - 3(2z + 1)$$

$$7 + 6z - 10 = 8 - 6z - 3$$

$$6z - 3 = 5 - 6z$$

$$6z - 3 + 6z = 5 - 6z + 6z$$

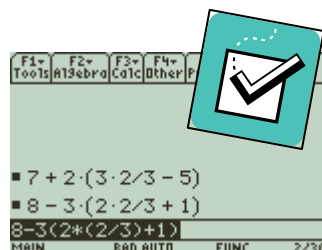
$$12z - 3 = 5$$

$$12z - 3 + 3 = 5 + 3$$

$$12z = 8$$

$$\frac{1}{12} \cdot (12z) = \frac{1}{12} \cdot (8)$$

$$z = \frac{8}{12} = \frac{2}{3}$$



The solution set to  $7 + 2(3z - 5) = 8 - 3(2z + 1)$  is  $\left\{\frac{2}{3}\right\}$ .

12. Find the solution to the equation  $\frac{y}{12} + \frac{1}{6} = \frac{y}{2} - \frac{1}{4}$ .

$$\frac{y}{12} + \frac{1}{6} = \frac{y}{2} - \frac{1}{4}$$

$$12 \cdot \left(\frac{y}{12} + \frac{1}{6}\right) = 12 \cdot \left(\frac{y}{2} - \frac{1}{4}\right)$$

$$\frac{12}{1} \cdot \frac{y}{12} + \frac{12}{1} \cdot \frac{1}{6} = \frac{12}{1} \cdot \frac{y}{2} - \frac{12}{1} \cdot \frac{1}{4}$$

$$y + 2 = 6y - 3$$

$$y + 2 - y = 6y - 3 - y$$

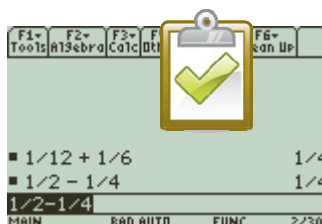
$$2 = 5y - 3$$

$$2 + 3 = 5y - 3 + 3$$

$$5 = 5y$$

$$\frac{1}{5} \cdot (5) = \frac{1}{5} \cdot (5y)$$

$$1 = y$$



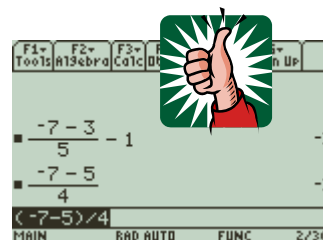
The solution to the equation

$$\frac{y}{12} + \frac{1}{6} = \frac{y}{2} - \frac{1}{4} \text{ is } 1.$$

13. Find the solution set to the equation  $\frac{x-3}{5} - 1 = \frac{x-5}{4}$ .

$$\begin{aligned}\frac{x-3}{5} - 1 &= \frac{x-5}{4} \\ 20 \cdot \left( \frac{x-3}{5} - 1 \right) &= 20 \cdot \left( \frac{x-5}{4} \right) \\ \frac{20}{1} \cdot \left( \frac{x-3}{5} \right) - 20 \cdot 1 &= \frac{20}{1} \cdot \left( \frac{x-5}{4} \right) \\ 4(x-3) - 20 &= 5(x-5) \\ 4x - 12 - 20 &= 5x - 25 \\ 4x - 32 &= 5x - 25 \\ 4x - 32 - 4x &= 5x - 25 - 4x \\ -32 &= x - 25 \\ -32 + 25 &= x - 25 + 25 \\ -7 &= x\end{aligned}$$

$$\begin{aligned}\frac{\cancel{20}^4}{1} \cdot \left( \frac{x-3}{\cancel{5}_1} \right) &= 4(x-3) \\ \frac{\cancel{20}^5}{1} \cdot \left( \frac{x-5}{\cancel{4}_1} \right) &= 5(x-5)\end{aligned}$$



The solution set to the equation  $\frac{x-3}{5} - 1 = \frac{x-5}{4}$  is  $\{-7\}$ .